Claims

1. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) a sizing dispersion comprising a sizing agent and a polymer having one or more aromatic groups, and

(ii) a sizing promoter comprising a polymer having one or more aromatic groups,

forming and draining the obtained suspension, wherein the sizing dispersion and the sizing promoter are added separately to the aqueous suspension.

2. The process according to claim 1, wherein the sizing dispersion is anionic or cationic.

3. The process according to claim 1, wherein the sizing agent is a cellulose-reactive sizing agent.

4. The process according to claim 3, wherein the sizing agent is a ketene dimer or an acid anhydride.

5. The process according to claim 3, wherein the sizing agent is a ketene dimer.

6. The process according to claim 1, wherein the polymer having one or more aromatic groups comprised in the sizing promoter is charged.

7. The process according to claim 1, wherein the polymer having one or more aromatic groups comprised in the sizing dispersion is anionic or cationic.

8. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) a sizing dispersion comprising a sizing agent, a polymer having one or more aromatic groups, and

(ii) a sizing promoter comprising a first polymer having one or more aromatic groups and a second polymer having one or more aromatic groups,

forming and draining the obtained suspension, wherein the sizing dispersion and the sizing promoter are added separately to the aqueous suspension.

9. The process according to claim 8, wherein the first and second polymer of the sizing promoter are added separately to the aqueous suspension.

10. The process according to claim 8, wherein the sizing dispersion is anionic or cationic.

11. The process according to claim 8, wherein the sizing agent is a cellulose-reactive sizing agent.

12. The process according to claim 11, wherein the sizing agent is a ketene dimer or an acid anhydride.

13. The process according to claim 11, wherein the sizing agent is a ketene dimer.

14. The process according to claim 8, wherein the first and second polymer comprised in the sizing promoter are charged.

15. The process according to claim 8, wherein the net charge of the first and second polymer comprised in the sizing promoter are opposite.

16. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) a sizing dispersion comprising a sizing agent and a polymer having one or more aromatic groups, and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups, and an anionic polymer having one or more aromatic groups being a step-growth polymer, a polysaccharide or a naturally occurring aromatic polymer,

forming and draining the obtained suspension, wherein the sizing dispersion and the sizing promoter are added separately to the aqueous suspension.

17. The process according to claim 16, wherein the sizing dispersion is anionic or cationic.

18. The process according to claim 16, wherein the sizing agent is a cellulose-reactive sizing agent.

19. The process according to claim 18, wherein the sizing agent is a ketene dimer or an acid anhydride.

20. The process according to claim 18, wherein the sizing agent is a ketene dimer.

21. The process according to claim 16, wherein the cationic organic polymer of the sizing promoter is a cationic polysaccharide or a cationic vinyl addition polymer.

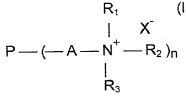
22. The process according to claim 16, wherein the cationic organic polymer of the promoter is a cationic polysaccharide.

23. The process according to claim 16, wherein the anionic polymer of the promoter is a step-growth polymer or a naturally occurring aromatic polymer.

24. The process according to claim 16, wherein the anionic polymer of the promoter is a naphthalene sulphonate condensation polymer or a modified lignin polymer.

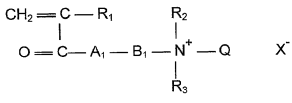
25. The process according to claim 24, wherein the anionic polymer of the promoter is condensated naphthalene sulphonate or ligninsulphonate.

26. The process according to claim 21, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

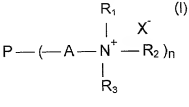
wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion; or vinyl addition polymers obtained by polymerising a cationic monomer or a monomer mixture comprising a cationic monomer represented by the general formula (II):



(II)

wherein R_1 is H or CH_3; R_2 and R_3 are each an alkyl group having from 1 to 3 carbon atoms, A_1 is O or NH, B_1 is an alkylene group having from 2 to 8 carbon atoms or a hydroxy propylene group, Q is a substituent containing an aromatic group, and X^- is an anionic counterion.

27. The process according to claim 22, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion.

28. The process according to claim 27, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

29. The process according to claim 16, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

30. The process according to claim 16, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

31. The process according to claim 16, wherein the conductivity of the suspension is at least 3.5 mS/cm.

32. The process according to claim 31, wherein the conductivity of the suspension is at least 4.5 mS/cm.

33. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) a sizing dispersion comprising a sizing agent and an anionic polymer having one or more aromatic groups being a step-growth polymer, a polysaccharide or a naturally occurring aromatic polymer, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

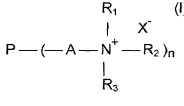
(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups, and an anionic polymer having one or more aromatic groups being a step-growth polymer, a polysaccharide or a naturally occurring aromatic polymer, the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and the sizing promoter are added separately.

34. The process according to claim 33, wherein the cationic organic polymer is a cationic polysaccharide or a cationic vinyl addition polymer.

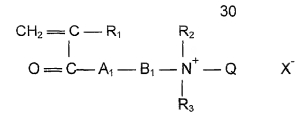
35. The process according to claim 33, wherein the cationic organic polymer is a cationic polysaccharide.

36. The process according to claim 34, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

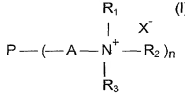
wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion; or vinyl addition polymer obtained by polymerising a cationic monomer or a monomer mixture comprising a cationic monomer represented by the general formula (II):



(II)

wherein R_1 is H or CH_3; R_2 and R_3 are each an alkyl group having from 1 to 3 carbon atoms, A_1 is O or NH, B_1 is an alkylene group having from 2 to 8 carbon atoms or a hydroxy propylene group, Q is a substituent containing an aromatic group, and X^- is an anionic counterion.

37. The process according to claim 35, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion.

38. The process according to claim 37, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

39. The process according to claim 33, wherein the anionic polymer of the sizing dispersion and promoter is a step-growth polymer or a naturally occurring aromatic polymer.

40. The process according to claim 39, wherein the anionic polymer is a naphthalene sulphonate condensation polymer, a polystyrene sulphonate polymer or a modified lignin polymer.

41. The process according to claim 39, wherein the anionic polymer is a naphthalene sulphonate condensation polymer or a modified lignin polymer.

42. The process according to claim 39, wherein the anionic polymer is condensated naphthalene sulphonate or lignin sulphonate.

43. The process according to claim 33, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

44. The process according to claim 33, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

45. The process according to claim 33, wherein the conductivity of the suspension is at least 3.5 mS/cm.

46. The process according to claim 45, wherein the conductivity of the suspension is at least 4.5 mS/cm.

47. The process according to claim 33, wherein the sizing agent is a cellulose-reactive sizing agent.

48. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) a sizing dispersion comprising a sizing agent, a cationic organic polymer having one or more aromatic groups and an anionic polymer having one or more aromatic groups being a step-growth polymer, a polysaccharide or a naturally occurring aromatic polymer, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

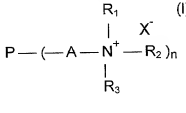
(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups, and an anionic polymer having one or more aromatic groups being a step-growth polymer, a polysaccharide or a naturally occurring aromatic polymer, the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and the sizing promoter are added separately.

49. The process according to claim 48, wherein the cationic organic polymer of the sizing dispersion and promoter is a cationic polysaccharide or a cationic vinyl addition polymer.

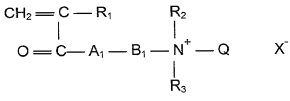
50. The process according to claim 48, wherein the cationic organic polymer of the sizing dispersion and promoter is a cationic polysaccharide.

51. The process according to claim 49, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

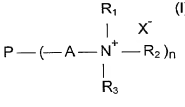
wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion; or vinyl addition polymer obtained by polymerising a cationic monomer or a monomer mixture comprising a cationic monomer represented by the general formula (II):



(II)

wherein R_1 is H or CH_3; R_2 and R_3 are each an alkyl group having from 1 to 3 carbon atoms, A_1 is O or NH, B_1 is an alkylene group having from 2 to 8 carbon atoms or a hydroxy propylene group, Q is a substituent containing an aromatic group, and X^- is an anionic counterion.

52. The process according to claim 50, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion.

53. The process according to claim 52, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

54. The process according to claim 48, wherein the anionic polymer of the sizing dispersion and promoter is a step-growth polymer or a naturally occurring aromatic polymer.

55. The process according to claim 54, wherein the anionic polymer is a naphthalene sulphonate condensation polymer, a polystyrene sulphonate polymer or a modified lignin polymer.

56. The process according to claim 54, wherein the anionic polymer is a naphthalene sulphonate condensation polymer or a modified lignin polymer.

57. The process according to claim 54, wherein the anionic polymer is condensated naphthalene sulphonate or lignin sulphonate.

58. The process according to claim 48, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

59. The process according to claim 48, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

60. The process according to claim 48, wherein the conductivity of the suspension is at least 3.5 mS/cm.

61. The process according to claim 60, wherein the conductivity of the suspension is at least 4.5 mS/cm.

62. The process according to claim 48, wherein the sizing agent is a cellulose-reactive sizing agent.

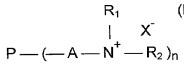
63. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) a sizing dispersion comprising a sizing agent and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation polymer, a polystyrene sulphonate polymer or a modified lignin polymer, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups being a cationic polysaccharide, and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation polymer or a modified lignin polymer, the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and the sizing promoter are added separately.

64. The process according to claim 63, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

R_3

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion.

65. The process according to claim 64, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

66. The process according to claim 63, wherein the anionic polymer of the sizing dispersion and promoter is a naphthalene sulphonate condensation polymer or a modified lignin polymer.

67. The process according to claim 66, wherein the anionic polymer is condensated naphthalene sulphonate or lignin sulphonate.

68. The process according to claim 63, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

69. The process according to claim 63, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

70. The process according to claim 63, wherein the conductivity of the suspension is at least 3.5 mS/cm.

71. The process according to claim 63, wherein the conductivity of the suspension is at least 4.5 mS/cm.

72. The process according to claim 63, wherein the sizing agent is a cellulose-reactive sizing agent.

73. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

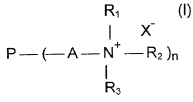
(i) a sizing dispersion comprising a sizing agent, a cationic organic polymer having one or more aromatic groups being cationic polysaccharide and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation polymer, a polystyrene sulphonate polymer or a modified lignin polymer, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups being a cationic polysaccharide, and an anionic polymer having

one or more aromatic groups being a naphthalene sulphonate condensation polymer, a polystyrene sulphonate polymer or a modified lignin polymer, the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and the sizing promoter are added separately.

74. The process according to claim 73, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion.

75. The process according to claim 74, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

76. The process according to claim 73, wherein the anionic polymer of the sizing dispersion and promoter is a naphthalene sulphonate condensation polymer or a modified lignin polymer.

77. The process according to claim 76, wherein the anionic polymer is condensated naphthalene sulphonate or lignin sulphonate.

78. The process according to claim 73, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

79. The process according to claim 73, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

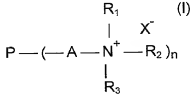
80. The process according to claim 73, wherein the conductivity of the suspension is at least 4.5 mS/cm.

81. The process according to claim 73, wherein the sizing agent is a cellulose-reactive sizing agent.

82. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) a sizing dispersion comprising a sizing agent and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation polymer, a polystyrene sulphonate polymer or a modified lignin polymer, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups being cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion, and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation polymer or a modified lignin polymer, the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and the sizing promoter are added separately.

83. The process according to claim 82, wherein the anionic polymer of the sizing dispersion and promoter is a naphthalene sulphonate condensation polymer or a modified lignin polymer.

84. The process according to claim 83, wherein the anionic polymer is condensated naphthalene sulphonate or lignin sulphonate.

85. The process according to claim 82, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

86. The process according to claim 82, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

87. The process according to claim 82, wherein the conductivity of the suspension is at least 3.5 mS/cm.

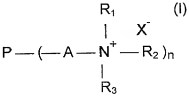
88. The process according to claim 82, wherein the sizing agent is a cellulose-reactive sizing agent.

89. The process according to claim 82, wherein the sizing agent is present in the dispersion in an amount of from about 0.1 up to about 50 % by weight based on total emulsion.

90. The process according to claim 82, wherein anionic polymer of the sizing dispersion is present in an amount of from about 0.1 % up to about 15 % by weight based on sizing agent.

91. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

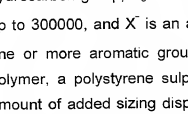
(i) a sizing dispersion comprising a sizing agent, a cationic polymer having one or more aromatic groups being a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion, and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation polymer, a polystyrene sulphonate polymer or a modified lignin polymer, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups being cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion, and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation

polymer or a modified lignin polymer, the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and the sizing promoter are added separately.

92. The process according to claim 91, wherein the anionic polymer of the sizing dispersion and promoter is a naphthalene sulphonate condensation polymer or a modified lignin polymer.

93. The process according to claim 91, wherein the anionic polymer is condensated naphthalene sulphonate or lignin sulphonate.

94. The process according to claim 91, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

95. The process according to claim 91, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

96. The process according to claim 91, wherein the conductivity of the suspension is at least 3.5 mS/cm.

97. The process according to claim 91, wherein the sizing agent is a cellulose-reactive sizing agent.

98. The process according to claim 91, wherein the sizing agent is present in the dispersion in an amount of from about 0.1 up to about 50 % by weight based on total emulsion.

99. The process according to claim 91, wherein anionic polymer of the sizing dispersion is present in an amount of from about 0.1 % up to about 15 % by weight based on sizing agent.

100. The process according to claim 91, wherein cationic polymer of the sizing dispersion is present in an amount of from about 0.1 % up to about 15 % by weight based on sizing agent.